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数理解析研究所講究録1433

短期共同研究

Deformation of linear differential equations and their virtual turning points

京都大学数理解析研究所

2005年5月

RIMS Kokyuroku 1433

Deformation of linear differential equations and their virtual turning points

May, 2005

Research Institute for Mathematical Sciences

Kyoto University, Kyoto, Japan

Preface

This is the proceedings of the workshop

> "Deformation of linear differential equations and their virtual turning points"

which was held at RIMS from March 8 through March 11, 2005. As the most important contributions of S. Sasaki (On the role of virtual turning points in the deformation of higher order ordinary differential equations, I and II) are written in Japanese, I am afraid several non-Japanese mathematical scientists might overlook them. But they are really important and intriguing in the exact WKB analysis of higher order ordinary differential equations. I believe it is worth while learning Japanese just for reading the reports of Sasaki for those interested in the subject; in the first report Sasaki shows that virtual turning points are indispensable for analyzing linear differential equations associated with the Noumi-Yamada system $(NY)_l$, even in the simplest case where $l = 2$. In the second report, Sasaki discusses a particular linear differential equation $(L)_4$ associate with $(NY)_4$, with an emphasis on the understanding of the so-called Nishikawa phenomenon for $(NY)_4$; in order to neatly explain the mechanism of the occurrence of such a phenomenon, he introduces the notion of a "napping virtual turning points" of $(L)_4$. This notion seems to bear universal importance in studying the Nishikawa phenomenon for Painlevé hierarchies when the underlying linear equations are of higher order (like $(L)_4$). At the same time, I personally feel our understanding of the notion is still inadequate, particularly in its sleeping region; more comprehensive understanding of napping virtual turning points should be substantially useful in the theory of virtual turning points in the large.

In addition to the contributions by Sasaki, the report of A.Shudo is also worth calling the attention of the reader; actually most of the attendants gained an "instanton-type" insight into his work at his talk. As it is written in English fortunately, I don't think I need to add any more explanation of the report.

In ending the preface I like to note my expectation that this proceedings will turn out to be one of the classics in the exact WKB analysis in spite of a linguistic bareer, in view of the decisive importance of the results reported here.

May, 2005 in Kyoto

河合 隆裕

Takahiro KAWAI
Deputy Organizer of the Workshop

Deformation of linear differential equations and their virtual turning points
線型微分方程式の変形と仮想的変わり点
短期共同研究報告集

２００５年３月８日～３月１１日

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